

# Occupational Projections and Training Data

2000-01  
Edition



---

U.S. Department of Labor  
Alexis M. Herman, Secretary

Bureau of Labor Statistics  
Katharine G. Abraham, Commissioner

May 2000

Bulletin 2521

## Chapter IV. Estimating Occupational Replacement Needs

Information about projected job openings by occupation—openings that result from employment growth or the need to replace workers who leave an occupation—has many important applications. For example, students and vocational counselors use this information to make career choice decisions; planners of training programs use it to develop education policies; and personnel specialists use it in planning their recruiting efforts. The BLS has provided information on employment growth biennially through its employment projections program over the past five decades and, in 1992, resumed estimating job openings resulting from replacement needs.

After completing a comprehensive research effort, BLS researchers concluded that two definitions and two estimates of separations were needed to provide appropriate replacement needs information for different users. The first type of estimate, *total separations*, measures all individuals who leave their occupation. The second, *net separations*, measures the net movements of new and experienced workers into and out of occupations. As discussed below, both measures of separations are developed from the Current Population Survey, but each measure uses a different data element from the survey.

### Concepts and definitions

During the past several decades, a variety of concepts have been used to calculate estimates of occupational replacement needs and job openings. These different concepts result in significantly different estimates of separations for the same occupation that often have confused users of the information. This section briefly summarizes the concepts currently used by BLS to calculate replacement needs data. Figure 1 illustrates the differences between total and net separations.

*Total separations.* Total separations identify the flow of individuals leaving an occupation, for any reason whatsoever, without regard to persons entering the occupation. Total separations are the larger measure of separations. During a given period, individuals may leave an occupation for a variety of reasons, and must be replaced. Some become employed in a different occupation as a result of a promotion, a desire to change careers, the loss of an existing job, the need for a different job while attending school or training or caring for family, or some other reason. Others who leave an occupation stop working altogether because they retire, desire more time for leisure or for an ex-

tended vacation, assume family responsibilities, return to school, move out of the geographic area, become ill, or for some other reason. If employment in an occupation is to increase or remain the same, those individuals who left the occupation must be replaced. In most cases, total occupational separations are thus replacement needs and a source of job openings. If employment is declining, however, occupational separations exceed replacement needs by the amount of decline in employment because some persons who leave the occupation are not replaced. (Individuals who change employers but remain employed in the same occupation are not included in counts of replacement needs because job changes by these individuals have no impact on the number of openings for persons desiring to enter an occupation.)

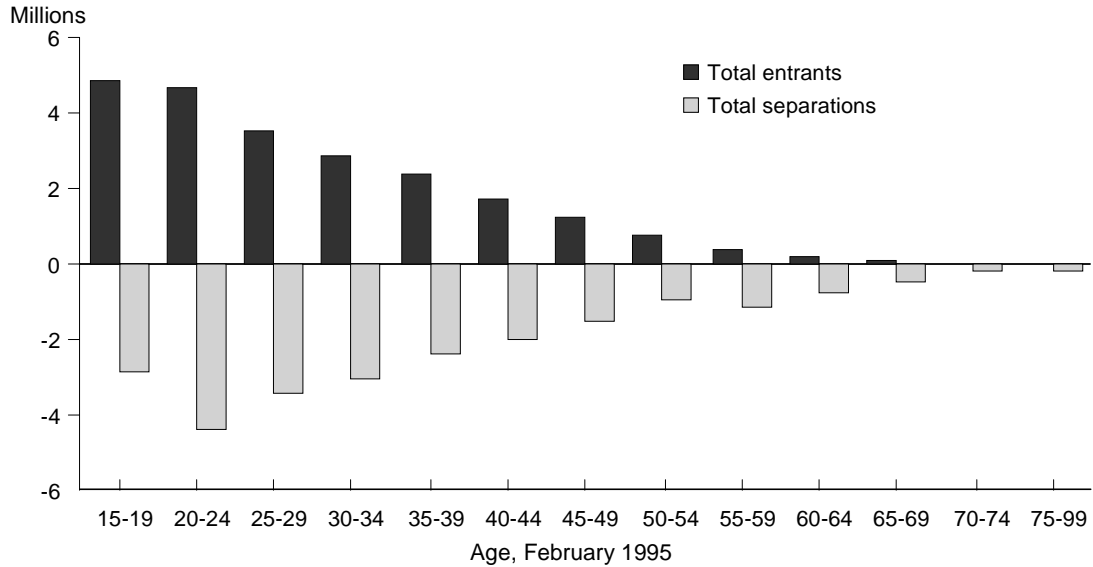
*Net separations.* Net separations summarize movements of workers into and out of an occupation over a specific period. If employment is not declining, net separations approximate the number of persons who permanently leave an occupation: they quantify the need for new entrants, and if training is required, identify minimum training requirements.

Employment data, by age, for two points in time are used to estimate net separations. For example, occupational employment, by age, is prepared for a base year and for a second year 5 years later. Employment figures for each age group in the base year are then compared with employment figures for the group that is 5 years older. For example, in a given occupation, employment in the base year for the 55- to 59-year-old group is compared with employment in the second year for the 60- to 64-year-old group. If employment has increased from the base-year group to the older, second-year group, then the increase measures net entrants into the occupation for the second group, and net separations from the occupation for that group are zero. If, instead, employment has declined across the two groups, the decline is recorded as net separations from that occupation. The total net separations from the occupation in question are then the sum of the net separations from that occupation for all age groups.

It is important to note that, within any age group, individuals may have done any of the following to stop being included in employment data for the occupation: Left the occupation and started working in another occupation, stopped working altogether, or left the region. Similarly, individuals entering the occupation may have been working

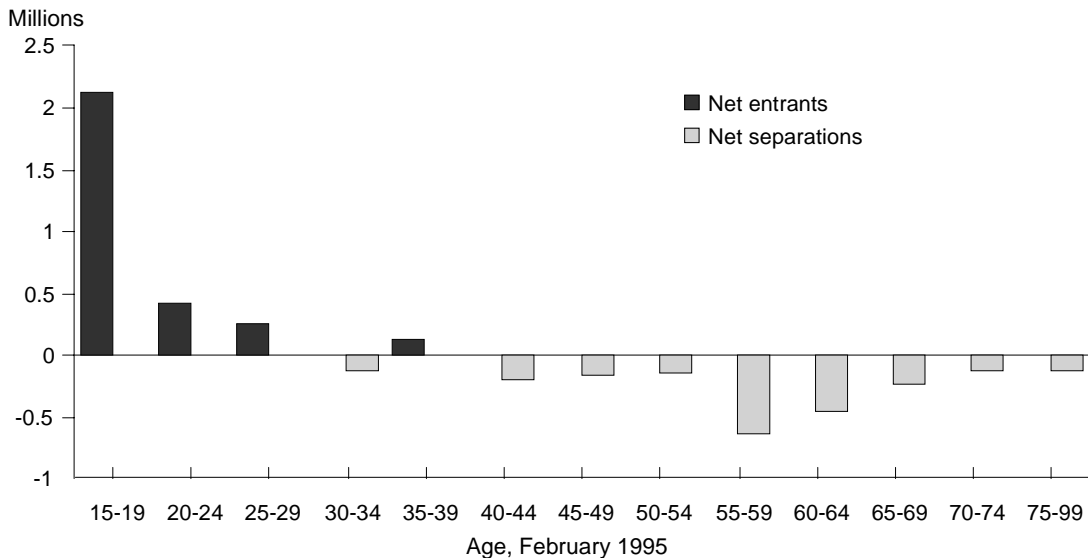
**Total separations:**

- Occur in all age groups
- Are independent of the total number of entrants
- Identify all of the normal movements out of occupations



**Net separations:**

- Occur only when total separations exceed total entrants within an age group
- For an occupation, are the sum of separations for each age group
- Exclude information about net entrants



**Figure 1. Total and net occupational entrants and separations, February 1995 to February 1996**

in another occupation, may not have been working at all, or may have come from another region. The change measured over the period in question thus reveals only whether there were more or fewer entrants than separations, and tells nothing about the magnitude of total entrants, total separations, or any of their components. That is, the change indicates whether the size of the original age group increased or decreased, but it indicates nothing about the specific actions of individuals making up the group.

*Replacement needs.* In developing estimates of replacement needs, the distinction between total and net separations and replacement needs pertaining to an occupation must not be overlooked. When employment in an occupation remains the same or increases over a given period, replacement needs equal separations. Conversely, when employment declines, replacement needs are less than separations because some individuals leaving an occupation are not replaced.

During a period when employment in an occupation declines, total separations will be greater than they would be if employment increased because more individuals lose their jobs. Net separations would be greater not only because more individuals leave, but also because fewer enter the occupation. A decline in employment represents individuals who left an occupation and were not replaced; therefore, replacement needs during a time of declining employment are determined by reducing observed separations by the decline in employment.

Although it is conceptually possible that employment could decline to zero, the possibility is remote, especially with national data. In such an unlikely scenario, separations would equal the previous number of employees because all lost their jobs, and replacement needs would be zero (replacement needs = separations - employment decline = 0). During periods of employment decline, displaced workers are available to reenter the occupation later, and thus may reduce the need for training additional workers.

### **Developing measures of total separations**

All individuals who leave an occupation—those who transfer to another occupation or who stop working for any reason—must be included in a measure of total separations. Producing such a measure requires longitudinal data that include information about individuals at two points in time. During the late 1970's, BLS researchers developed a procedure, using CPS data, for estimating the total number of job openings arising from workers who leave their occupation between two points that are 1 year apart. Annual data are preferable to data with other periodicities because most data on training program completions are compiled on an annual basis. Annual total separation data thus facilitate analyses of occupational supply and demand.

The method of measuring total separations consisted of using computer records to identify the same individuals in the CPS to create a matched sample over a 1-year period. In

prior years, matched data were created for each of the 12 months and then were combined, resulting in a sample of about 500,000 persons aged 15 and older in the initial year. For this report, however, only 4 months of data (September through December) were available from 1995 and 1996 because identifying codes were suppressed due to a survey design change needed to protect the confidentiality of survey respondents. Suppressing the codes precluded identifying individuals in both samples.

With the matched sample, changes in an individual's employment status and occupation were tabulated. Next, the 4 months of matched data for 1995-96 dealing with changes in labor force status were merged with data on occupational transfers from a special study conducted as part of the February 1996 CPS. Occupational transfer data from the February 1996 CPS were used because matched CPS data overstate the number of workers who change occupations.

The excessively large estimate of occupational transfers in matched CPS data occurs because individuals may respond differently to the same CPS question about their occupation, responses may be recorded differently by interviewers collecting the data, or recorded information may be interpreted and coded differently by persons preparing files for computer processing. All these actions result in a different occupation being recorded in the second year when, in fact, no change of occupation occurred.

Combining 1995-96 matched CPS data and occupational transfer data from the February 1996 CPS yields *merged data* that provide a composite description of movements into, out of, and between occupations over two points 1 year apart. The resulting merged data identify the numbers and types of separations and the characteristics of workers who change occupations, become unemployed, or leave the labor force.

Total separations data for occupations with fewer than 50,000 employees in 1996 were judged unreliable because of the limited number of observations in the sample. Data for the remaining occupations were examined individually, and if data identifying specific reasons for leaving the occupation appeared suspect, another detailed occupational group was selected to serve as a proxy and provide substitute data.

The CPS is conducted primarily to obtain current data on the labor force status of individuals, rather than data that measure changes over time. There are significant limitations to the data that describe change as a result. The CPS is a household survey that obtains data about persons living at specific addresses. One limitation to the matched sample is that information can be developed only from the responses of individuals who do not change their residence. Movers tend to change their labor force status more than do non-movers; hence, the separation rates are biased downward because movers are not included. Separation rates also are biased downward because the CPS excludes individuals who die between surveys.

By contrast, response and coding errors bias the separation rates upward. For example, if employed persons were

incorrectly classified as not being in the labor force during the second survey, the matched data would indicate movement where none occurred. Although the net effect of the various biases on the movements is not known, their impact is offsetting and not concentrated by occupation.

It must be emphasized that total separation rates developed from merged CPS data are not measured rates based on longitudinal data about individuals, but, rather, are a composite estimate of movements from occupations based on CPS data from two distinct sources. However, the rates are occupation specific and are extremely valuable for describing the labor market.

### Developing measures of net separations

Because the classification system used in the CPS has changed little since 1983, changes in age groups over a 5-year period provide a comprehensive measure of occupation-specific net separations. When the size of a group increases, a measure of net entrants is recorded; when it declines, net separations are identified. Net changes in an age group capture the net effect of transfers into and out of occupations, immigration, and emigration, as well as of labor force entries and separations, including deaths. A 5-year period was chosen so as to reduce the impact of cyclical variations that might accompany a shorter period. Data for other periods can be developed, however. Data also can be developed by industry, educational level, sex, and a variety of other demographic variables. This "cohort" technique thus becomes a powerful tool for analyzing labor market changes.

Employment data for appropriate age groups, by occupation, were developed for 1989-94, 1990-95, 1991-96, 1992-97, and 1993-98. Initially, several hundred thousand records containing information on occupation, age, and many other characteristics for all employed persons in 1989 were combined, and occupational employment by age group was tabulated. The process was repeated to obtain

**Table 6. Net separations for registered nurses and for waiters and waitresses, by age group, 1993-98**

(Numbers in thousands)

(Numbers in thousands)

1993 employment		1998 employment		Net change	Net separations, 1993-98	Separation rate, 1993-98
Age	Number	Age	Number			
<b>Registered nurses</b>						
16-99.....	1,733	—	2,006	273	116	6.7
		16-20	1	1	0	
16-19.....	1	21-24	65	64	0	0
20-24.....	75	25-29	203	128	0	0
25-29.....	211	30-34	282	71	0	0
30-34.....	307	35-39	355	48	0	0
35-39.....	332	40-44	398	66	0	0
40-44.....	287	45-49	298	11	0	0
45-49.....	202	50-54	190	-13	13	6.2
50-54.....	137	55-59	122	-15	15	10.8
55-59.....	101	60-64	61	-40	40	39.4
60-64.....	57	65-69	21	-36	36	63.3
65-69.....	16	70-74	7	-9	9	56.6
70-74.....	4	75-79	1	-3	3	68.1
75-99.....	1	80-99	1	0	0	20.0
<b>Waiters and waitresses</b>						
16-99.....	1,382	—	1,403	21	426	30.7
		16-20	273	273		
16-19.....	223	21-24	396	173	0	0
20-24.....	382	25-29	218	-164	165	43.1
25-29.....	228	30-34	158	-70	69	30.5
30-34.....	181	35-39	131	-50	50	27.7
35-39.....	128	40-44	81	-47	47	36.8
40-44.....	80	45-49	50	-30	30	37.1
45-49.....	56	50-54	37	-19	19	33.8
50-54.....	38	55-59	25	-13	13	33.2
55-59.....	29	60-64	21	-8	8	28.1
60-64.....	24	65-69	8	-16	16	66.6
65-69.....	9	70-74	3	-6	6	63.8
70-74.....	3	75-79	1	-2	2	61.4
75-99.....	1	80-99	1	0	1	40.9

Note: 1993 data are averages of 1989, 1990, 1991, 1992, and 1993; 1998 are averages of 1994, 1995, 1996, 1997 and 1998.

data for desired age groups in 1994. To increase the sample size and reduce cyclical fluctuations, data for the same age groups recorded for 1989 were developed for 1990, 1991, 1992, and 1993, and data for the age groups used in 1994 were developed for 1995, 1996, 1997, and 1998. Data on employment by occupation, by age group, were then averaged and used to prepare the data presented in this chapter. To simplify the presentation, all references to 1993 data represent averages for 1989, 1990, 1991, 1992, and 1993, and references to 1998 data represent averages for 1994, 1995, 1996, 1997, and 1998.

Net leavers in most occupations occur only in the older age groups, usually above age 45. This pattern typically describes individuals leaving in large numbers to retire. A different pattern displayed in some occupations is the vast majority of all net separations taking place in the youngest age groups. In this case, large numbers of workers probably obtained employment in the occupation when they first entered the workforce. When they were ready to begin full-time jobs, or when they qualified for higher paying jobs,

**Table 7. Net separations in selected occupations, by age group, 1993-98**

(Numbers in thousands)

Current Population Survey occupation	Number employed, 1993 <sup>1</sup>	Age group												
		16	20	25	30	35	40	45	50	55	60	65	70	75
		-	-	-	-	-	-	-	-	-	-	-	-	-
		19	24	29	34	39	44	49	54	59	64	69	74	79
Teachers, except college and university.....	4,109	0	0	0	0	0	0	48	92	105	75	26	9	5
Teachers, prekindergarten.....	463	0	0	0	0	0	6	12	10	8	7	2	0	0
Teachers, elementary school.....	1,561	0	0	0	0	0	0	12	41	44	31	9	2	1
Teachers, secondary school.....	1,214	0	0	0	0	0	7	29	46	42	24	7	2	1
Teachers, special education.....	273	0	0	0	0	0	0	0	0	1	4	2	0	0
Teachers, n.e.c. <sup>2</sup> .....	599	0	0	0	0	0	0	0	0	9	10	6	5	3

<sup>1</sup> 1993 data are averages of 1989, 1990, 1991, 1992, and 1993<sup>2</sup> n.e.c. = not elsewhere classified.

they transferred to another occupation. In both patterns, the net separations quantify the number of persons who permanently left the occupation. Table 6 shows these different patterns, and also illustrates how net separations for registered nurses and for waiters and waitresses were calculated.

In table 6, employment data by age group for registered nurses and for waiters and waitresses in 1993 are compared with corresponding data for a 5-year-older group in 1998. For example, the number of registered nurses aged 20-24 in 1993 is compared with the number of registered nurses aged 25-29 in 1998, and the difference is calculated. If the difference is positive, more individuals aged 20-24 in 1993 entered than left the occupation. Nothing is known about the numbers of persons transferring into the occupation, entering into the labor force, immigrating from another country, transferring out of the occupation, leaving the labor force, or leaving the United States. The difference between the two groups simply identifies the amount by which total entrants exceed total leavers. If, by contrast, the difference is negative, more individuals left than entered the occupation. Only a negative difference results in a measure of net separations. Positive differences are recorded as zero net separations for the age group. The separation rate for an age group is calculated by dividing net separations by 1993 employment in the age group. Net separations for all age groups were totaled and divided by total employment in 1993 to obtain the 5-year net separation rate for the occupation.

Table 6 also presents information on the percentage of leavers in each age group for registered nurses and for waiters and waitresses. This measure is calculated by dividing net leavers in the age group by 1993 employment for that age group. Information about the percentage of leavers in each age group is valuable because it permits estimates of net leavers in the future, which will be discussed later.

Registered nurses and waiters and waitresses are large occupations, so the CPS sample for these occupations provides quite reliable employment data for each age group within them. For small occupations, however, such as actuaries, statisticians, and mathematical scientists not elsewhere classified, the sample is too small and the net separation data are unreliable. For example, statisticians have an irregular distribution of net separations among the age

groups, and the net separation rate of about 25 percent is inconsistent with rates for other professional occupations.

To obtain a separation rate for each detailed CPS occupation, one of two procedures was used when an occupation was judged to be unreliable on the basis of its data. When a larger detailed occupation had characteristics similar to those of the occupation in question, the larger occupation was chosen as a proxy for it, and the separation and employment data for the proxy occupation were substituted for the unreliable data and were used to calculate separation rates. When there was no larger detailed occupation with characteristics similar to those of the occupation in question, separation and employment data for a summary occupation group were substituted for the unreliable data. This procedure for determining separation rates was not as straightforward as the former. Note in table 7 that, for the summary occupational group, teachers, except college and university, no net separations are measured in the data until age 45. Yet, of the detailed occupations making up the group, prekindergarten, and secondary school teachers, exhibit net separations prior to that age. The summary occupation does not register those separations because total net entrants in the other detailed occupations—elementary, special education, and not elsewhere covered teachers—exceeded the total of net separations among prekindergarten, and secondary school teachers. To exclude the measure of net separations from the summary occupation, however, would result in an understatement of separations from detailed occupations. To overcome this limitation, net separations in each age group for summary occupations were calculated by totaling the net separations for each detailed occupation in that age group. Thus, the net separations data for each age group for the summary occupation group, teachers, except college and university, in table 8 is the sum of the data measured for prekindergarten, elementary, secondary, special education, and not elsewhere classified teachers. (Because unrounded data are used, the totals shown may not be the sum of the data for detailed occupations.)

### Projected replacement rates

Thus far, all information presented about separations has been descriptive and retrospective; that is, it has described

**Table 8. Net separations in selected occupations, adjusted summary occupation, by age group, 1993-98**  
(Numbers in thousands)

Current Population Survey occupation	Number employed, 1993 <sup>1</sup>	Age group												
		16	20	25	30	35	40	45	50	55	60	65	70	75
		-	-	-	-	-	-	-	-	-	-	-	-	-
		19	24	29	34	39	44	49	54	59	64	69	74	79
Teachers, except college and university.....	4,109	0	0	0	0	0	13	53	98	105	75	26	9	5
Teachers, prekindergarten.....	463	0	0	0	0	0	6	12	10	8	7	2	0	0
Teachers, elementary school.....	1,561	0	0	0	0	0	0	12	41	44	31	9	2	1
Teachers, secondary school.....	1,214	0	0	0	0	0	7	29	46	42	24	7	2	1
Teachers, special education.....	273	0	0	0	0	0	0	0	0	1	4	2	0	0
Teachers, n.e.c. <sup>2</sup> .....	599	0	0	0	0	0	0	0	0	9	10	6	5	3

<sup>1</sup> 1993 data are averages of 1989, 1990, 1991, 1992, and 1993

<sup>2</sup> n.e.c. = not elsewhere classified.

what has occurred in the past. The Bureau's Employment Projections program, however, focuses on future opportunities, a purpose that requires projections of employment change and, in addition, projections of replacement needs due to total and net separations.

*Total replacement rates.* Total separation rates for all detailed occupations were developed from merged CPS data for the period 1995-96. As described earlier, total separation rates from proxy occupations were substituted for small occupations because the data appeared unreliable. If employment in the occupation in question remained the same or increased from 1995 to 1996, the 1995-96 total separation rate also was the replacement rate and should be used to estimate replacement needs during a projection period. However, if employment declined, the replacement rate was calculated by subtracting the employment decline from the separations. Total replacement rates were used without adjustment for the 1998-2008 projection period. Employment for 2003, the midpoint of the projection period, was multiplied by the annual average rates for the 1995-96 period to project annual average replacement needs, 1998-2008. Although labor market conditions affect the replacement rates, attempts to adjust the rates would be fraught with difficulties because not enough is known about how cyclical factors and other labor market conditions affect the rates.

*Net replacement rates.* To develop a net separation rate for an occupation, employment figures for that occupation in a given age group in 1993 were compared with employment in the occupation in 1998 for a group that was 5 years older. As noted earlier, data for 1993 actually consist of the average of data for 1989, 1990, 1991, 1992, and 1993, and data for 1998 consist of the average for 1994, 1995, 1996, 1997, and 1998. If employment for the group increased, no net separations occurred, and separations were recorded as zero. If employment declined, the number was recorded as net separations for that age group. The 5-year net separation rate for the age group was calculated by dividing the number of net separations by employment in 1993. (See table 6.) The 5-year net separation rates for 1993-98 for each age group could then be applied to em-

ployment in future years to obtain a projection of net separations.

Between 1993 and 1998, employment in most occupations increased or remained the same. It should also be noted that the 1993-98 net separation rates, by age, were used without adjustment to estimate replacement needs during the projection period. If employment declined, however, one of several adjustments to the age-specific separation rates was used to obtain a replacement rate that reduced the occupational separation rate by the rate of decline in employment. When the employment decline was less than the number of net separations among persons aged 16 to 49 in 1993, the number of net separations among persons aged 16 to 49 was reduced by the employment decline. The decline was distributed in proportion to the number of net separations in each age subgroup in the group aged 16 to 49. This technique was most frequently used; it confines the adjustments to the ages most affected by adverse economic conditions. Older workers are more likely to remain employed until they retire. In most of the remaining cases, the net separations were reduced in a like fashion for persons aged 16 to 54 or persons aged 16 to 65, depending on the distribution of net separations in the occupation and the amount by which employment declined. Then, the adjusted age-specific rates were used to calculate future net replacement needs for persons employed in 1998. Excluded from these projections are replacement needs for persons who enter an occupation within the projection period.

Showing data for the persons employed as registered nurses in 1998, table 9 illustrates the method for calculating net leavers over the period 1998-2008. First, net leavers were calculated for 1998-2003 by multiplying 1998 employment obtained from the CPS for each age group by the replacement rate in 1993-98 for the same age group. Before net leavers in 2003-2008 were calculated, employment in 2003 for each age group was estimated by identifying employment in 1998 for a 5-year-younger age group and subtracting any projected net leavers for the period 1998-2003. For example, table 9 shows the 2003 employment figure for registered nurses aged 55 to 59 to be 169,000. This estimate was arrived at by identifying the 1998 employment figure for nurses aged 50 to 54 (190,000) and subtracting the 20,000 net leavers in 1998-2003 from that age group (discrepancies due to rounding). When employ-

ment for each age group for 2003 was developed, the resulting figure was multiplied by the replacement rate for that age group to estimate net leavers for 2003-2008. Summing the number of net leavers for each of the 5-year groups provided an estimate of net leavers for the 10-year period 1998-2008. Net leavers over the 10-year projection period 1998-2008 were determined by combining estimates for the 5-year periods 1998-2003 and 2003-2008. Dividing the net separations for 1998-2008 by 10 yielded annual average net separations; the annual average net separations were divided by 1998 employment to yield an annual average net separation rate.

New entrants—that is, individuals who were younger than age 16 in 1998 but who can be expected to join the group of employed persons after 1998—are not included in the estimate of separations for 1998-2008. If they were included, estimates of separations with net transfers in the younger age groups—such as those for waiters and waitresses—would be larger.

### Replacement rates based on the Occupational Employment Statistics survey

The preceding section described procedures for estimating annual average replacement rates of total and net separations for detailed CPS occupations. The BLS projections program uses an employment matrix to estimate current and projected employment data that primarily are based on the occupational classification system of the Occupation Employment Statistics (OES) survey. Current and projected occupational employment data based are used for calculating the employment change component of projected job openings. To obtain the replacement needs components of projected total and net job openings, estimates of total and net separations based on the OES survey occupations had to be developed. The procedure required total and net separation

**Table 9. Net replacement data for registered nurses, by age group, 1998-2008**

(Numbers in thousands)

Age	1998 employment <sup>1</sup>		Net replacement needs 1998-2003	2003 employment	Net replacement needs, 2003-2008
	Number	Replacement rate 1993-98 (Percent)		Number	
16-99.....	2,006	6.7	134	—	188
16-19....	1	0	0	0	0
20-24....	65	0	0	1	0
25-29....	203	0	0	65	0
30-34....	282	0	0	203	0
35-39....	355	0	0	282	0
40-44....	398	0	0	355	0
45-49....	298	6.2	18	398	25
50-54....	190	10.8	20	279	30
55-59....	122	39.4	48	169	67
60-64....	61	63.3	39	74	47
65-69....	21	56.6	12	23	13
70-74....	7	68.1	5	9	6
75-99....	2	20.0	0	4	1

<sup>1</sup> 1998 data are averages for 1994, 1995, 1996, 1997, and 1998

rates for all detailed occupations based on the OES survey. These rates were developed by identifying the CPS occupation or occupations that are equivalent to the detailed OES-survey-based occupation, and by either using the CPS rate directly or calculating a weighted rate using OES or CPS employment figures as weights if the occupation consisted of more than one OES or CPS occupation. This process was not required for matrix occupations based on CPS occupational classification data. Table 10 presents 1998-2008 total and net replacement rates for 1998 matrix occupations and identifies 1998-2008 annual average total and net replacement needs. Information identifying OES occupations for which CPS equivalent occupational data were replaced with that of a proxy CPS occupation, and the CPS occupation that provided the proxy data, is available from the Division of Occupational Outlook at (202) 691-5703.

## Frequently asked questions about replacement data

*Q. Why does BLS compute estimates of both total and net replacement needs data?*

A. A single estimate is not appropriate for all purposes. Vocational guidance counseling, for example, requires information about growth and replacement needs that quantifies all opportunities in the labor market. However, training program planning is better served with information about opportunities for new entrants. Thus, two different estimates are provided.

*Q. Why is the estimate of growth and net replacement needs described as providing a minimum measure of training needs?*

A. In the younger age groups, more individuals are entering than leaving the occupation, and the measure of net separations for that age group is zero. A trained person who died may require a replacement, but would not be included in net replacement needs estimates. More significantly, not all persons completing training enter the occupation for which they qualify. As a result, more workers must be trained to ensure that the minimum number enter the occupation.

*Q. Do the 1998-2008 projected net replacement rates assume that future labor market behavior will not change from past patterns?*

A. Yes, 1993-98 occupation- and age-specific rates are used in calculating the projected rates. The 1993-98 rates are applied to projected occupational age-distribution data. The result is an occupation-specific replacement rate that captures the impact of demographic, but not behavioral, changes.

*Q. Are total and net separation rates the same as total and net replacement needs?*

A. In most occupations, yes. If employment declines during the period being examined, however, separations will exceed replacement needs by the employment decline. When employment is declining, not all persons separating from the occupation are replaced.

*Q. Should a projected decline in employment be subtracted from replacement needs to estimate job opportunities?*

A. No! If employment declines, the number of opportunities resulting from growth is zero, with replacement needs comprising the only source. When employment declines, separations increase both because individuals are losing their jobs, and with net separations, because fewer are entering the occupation. Replacement needs—calculated by reducing separations by any decline in employment—should not be further reduced by projected employment declines.

*Q. If employment is declining rapidly, is it possible for replacement needs to be zero?*

A. In the extreme case, yes. For example, assume that, in a limited geographic area, a single firm is the sole employer of tool and die makers. If the firm ceases operations, all tool and die makers in the area will leave the occupation; separations will equal the decline in employment and there are no replacement needs. An analogous situation, though possible, is unlikely to occur at the national level because not all areas of the country share the same market conditions.

**Table 10. Total and net replacement rates and annual average replacement needs, 1998-2008**

(Numbers in thousands)

1998 Matrix occupation	Total employment, 1998	Replacement rate (Percent)			Annual average replacement needs, 1998-2008	
		Total, 1995-96	Net, 1998-2008		Total	Net
			Annual average	10-year		
<b>Total, all occupations</b> .....	140,514	17.4	2.4	23.6	26,199	3,311
<b>Executive, administrative, and managerial occupations</b> .....	14,770	11.6	1.8	18.1	1,847	268
Managerial and administrative occupations .....	10,139	11.2	1.8	17.7	1,233	180
Administrative services managers .....	364	10.1	1.8	17.5	40	6
Advertising, marketing, promotions, public relations, and sales managers .....	485	14.4	1.4	13.9	78	7
Communication, transportation, and utilities operations managers .....	196	10.1	1.8	17.5	22	3
Construction managers .....	270	10.1	1.8	17.5	29	5
Education administrators .....	447	11.4	2.5	25.1	54	11
Engineering, natural science, and computer and information systems managers .....	326	10.1	1.8	17.5	40	6
Financial managers .....	693	9.2	1.6	15.8	68	11
Food service and lodging managers .....	595	20.1	1.8	17.5	129	10
Funeral directors and morticians .....	28	11.9	1.8	17.8	4	( <sup>1</sup> )
General managers and top executives .....	3,362	10.1	1.8	17.5	366	59
Government chief executives and legislators <sup>2</sup> .....	80	6.7	2.5	25.1	5	2
Human resources managers .....	230	11.3	2.3	23.4	28	5
Industrial production managers .....	208	10.1	1.8	17.5	21	4
Medical and health services managers .....	222	9.2	1.8	17.8	24	4
Postmasters and mail superintendents .....	26	11.9	1.8	17.8	3	( <sup>1</sup> )
Property, real estate, and community association managers .....	315	12.8	1.3	13.4	43	4
Purchasing managers .....	176	12.8	2.2	22.5	23	4
All other managers and administrators <sup>2</sup> .....	2,114	11.2	1.8	17.6	254	37
<b>Management support occupations</b> .....	4,631	12.3	1.9	19.0	614	88
Accountants and auditors .....	1,080	10.3	1.5	15.5	117	17
Assessors and real estate appraisers .....	70	10.4	2.1	20.8	8	1
Assessors .....	22	6.5	2.3	23.1	2	1
Real estate appraisers .....	48	11.6	2.0	20.2	6	1
Budget analysts .....	59	13.9	2.2	21.9	9	1
Buyers and purchasing agents .....	371	19.9	2.5	25.3	76	9
Purchasing agents and buyers, farm .....	29	16.9	2.6	25.8	5	1
Purchasing agents, except wholesale, retail, and farm products .....	224	16.9	2.6	25.8	40	6
Wholesale and retail buyers, except farm products .....	118	26.3	2.4	24.2	31	3
Construction and building inspectors .....	68	3.3	2.6	25.7	2	2
Cost estimators .....	152	15.9	1.2	12.2	26	2
Credit analysts .....	42	13.9	2.2	21.9	6	1
Employment interviewers, private or public employment service .....	66	19.0	2.7	26.6	13	2
Human resources, training, and labor relations specialists .....	367	19.0	2.7	26.6	76	10
Inspectors and compliance officers, except construction .....	176	9.7	1.8	18.2	18	3
Insurance claims adjusters, appraisers, examiners, and investigators .....	239	6.2	1.7	16.7	16	4
Insurance claims adjusters, examiners, and investigators .....	229	6.2	1.7	16.7	16	4
Claims examiners, property and casualty insurance .....	49	6.2	1.7	16.7	3	1
Insurance adjusters, examiners, and investigators .....	180	6.2	1.7	16.7	12	3
Insurance appraisers, auto damage .....	10	6.2	1.7	16.7	1	( <sup>1</sup> )
Insurance underwriters .....	97	3.6	2.8	28.1	4	3
Loan counselors and officers .....	227	13.9	2.2	21.9	35	5
Management analysts <sup>2</sup> .....	344	3.6	0.8	7.9	14	3
Tax examiners, collectors, and revenue agents .....	62	7.4	2.2	21.8	5	1
Tax preparers .....	79	13.9	2.2	21.9	12	2
All other management support workers <sup>2</sup> .....	1,130	14.1	2.0	19.7	175	22
<b>Professional specialty occupations</b> .....	19,802	10.1	1.9	19.2	2,264	380
Engineers .....	1,462	6.5	2.2	21.8	104	32
Aerospace engineers <sup>2</sup> .....	53	2.1	1.6	16.2	1	1
Chemical engineers .....	48	6.8	2.2	22.5	3	1
Civil engineers .....	195	7.7	1.9	19.2	17	4
Electrical and electronics engineers .....	357	5.1	2.1	21.3	20	8
Industrial engineers, except safety engineers .....	126	8.6	1.4	14.2	12	2
Materials engineers .....	20	6.8	2.3	23.0	1	( <sup>1</sup> )
Mechanical engineers .....	220	2.4	1.9	19.3	6	4
Mining engineers, including mine safety engineers <sup>2</sup> .....	4	6.8	2.3	23.0	( <sup>1</sup> )	( <sup>1</sup> )
Nuclear engineers <sup>2</sup> .....	12	6.8	2.3	23.0	1	( <sup>1</sup> )

See footnotes at end of table.

**Table 10. Total and net replacement rates and annual average replacement needs, 1998-2008 — Continued**

(Numbers in thousands)

1998 Matrix occupation	Total employment, 1998	Replacement rate (Percent)			Annual average replacement needs, 1998-2008	
		Total, 1995-96	Net, 1998-2008		Total	Net
			Annual average	10-year		
Petroleum engineers <sup>2</sup> .....	12	6.8	2.3	23.0	1	( <sup>1</sup> )
All other engineers <sup>2</sup> .....	415	9.1	2.8	27.6	42	11
Architects and surveyors .....	163	8.6	1.7	16.9	15	3
Architects, except landscape and naval .....	99	5.4	1.5	14.9	6	1
Landscape architects .....	22	5.4	1.5	14.9	1	( <sup>1</sup> )
Surveyors, cartographers, and photogrammetrists <sup>2</sup> .....	41	17.8	2.3	22.7	7	1
Life scientists .....	173	7.2	2.4	24.1	14	4
Agricultural and food scientists <sup>2</sup> .....	21	6.2	2.6	25.7	1	1
Biological scientists .....	81	8.0	2.1	20.9	8	2
Conservation scientists and foresters <sup>2</sup> .....	39	6.2	2.6	25.7	3	1
Medical scientists .....	31	7.0	2.9	29.4	2	1
All other life scientists .....	1	8.0	2.1	20.9	( <sup>1</sup> )	( <sup>1</sup> )
Computer, mathematical, and operations research occupations .....	1,653	10.4	0.8	8.1	251	13
Actuaries <sup>2</sup> .....	16	9.6	1.4	14.2	2	( <sup>1</sup> )
Computer systems analysts, engineers, and scientists .....	1,530	10.6	0.7	6.8	243	10
Computer engineers and scientists .....	914	10.6	0.7	7.2	147	7
Computer engineers .....	299	10.6	0.6	6.2	49	2
Computer support specialists .....	429	10.6	0.6	6.2	69	3
Database administrators .....	87	10.1	1.6	16.3	12	1
All other computer scientists .....	97	10.6	0.6	6.2	16	1
Systems analysts .....	617	10.6	0.6	6.2	96	4
Statisticians <sup>2</sup> .....	17	9.6	1.4	14.2	2	( <sup>1</sup> )
Mathematicians and all other mathematical scientists <sup>2</sup> .....	14	9.6	1.4	14.2	1	( <sup>1</sup> )
Operations research analysts .....	76	5.9	3.1	31.3	5	2
Physical scientists .....	200	6.4	2.4	24.1	14	5
Atmospheric scientists .....	8	6.2	2.6	25.7	1	( <sup>1</sup> )
Chemists .....	96	6.6	2.2	22.3	7	2
Geologists, geophysicists, and oceanographers <sup>2</sup> .....	44	6.2	2.6	25.7	3	1
Physicists and astronomers <sup>2</sup> .....	18	6.2	2.6	25.7	1	( <sup>1</sup> )
All other physical scientists <sup>2</sup> .....	33	6.2	2.6	25.7	2	1
Religious workers .....	304	8.0	1.8	17.7	26	5
Clergy .....	149	7.7	2.0	19.6	12	3
Directors, religious activities and education <sup>2</sup> .....	112	8.4	1.6	15.9	10	2
All other religious workers <sup>2</sup> .....	43	8.4	1.6	15.9	4	1
Social scientists .....	321	11.8	1.9	19.5	41	6
Economists .....	70	13.4	2.1	20.8	10	1
Psychologists .....	166	11.2	1.8	18.5	20	3
Urban and regional planners <sup>2</sup> .....	35	11.8	2.0	20.4	4	1
All other social scientists <sup>2</sup> .....	50	11.8	2.0	20.4	6	1
Social and recreation workers .....	1,303	13.9	2.0	19.6	215	26
Recreation workers .....	241	14.9	2.6	26.4	39	6
Residential counselors .....	190	8.2	2.3	22.9	19	4
Social and human service assistants .....	268	22.9	2.6	26.1	78	7
Social workers .....	604	11.3	1.3	13.0	81	8
Lawyers and judicial workers .....	752	3.6	1.1	11.4	29	9
Judges, magistrates, and other judicial workers <sup>2</sup> .....	71	3.6	1.5	15.4	3	1
Lawyers .....	681	3.6	1.1	11.0	26	7
Teachers, librarians, and counselors .....	6,939	12.0	2.2	22.0	912	152
Teachers, preschool and kindergarten .....	529	8.4	2.1	21.3	49	11
Teachers, preschool .....	346	8.4	2.1	21.3	33	7
Teachers, kindergarten .....	184	8.4	2.1	21.3	16	4
Teachers, elementary school .....	1,754	9.9	2.3	23.1	184	41
Teachers, secondary school .....	1,426	6.4	3.2	31.9	101	46
Teachers, special education .....	406	4.8	0.8	8.4	23	3
College and university faculty <sup>2</sup> .....	865	12.4	2.8	27.7	120	24
Other teachers and instructors .....	956	23.0	1.1	10.5	241	10
Farm and home management advisors .....	10	23.0	1.1	10.5	2	( <sup>1</sup> )
Instructors and coaches, sports and physical training .....	359	23.0	1.1	10.5	94	4
Adult and vocational education teachers .....	588	23.0	1.1	10.5	145	6

See footnotes at end of table.

**Table 10. Total and net replacement rates and annual average replacement needs, 1998-2008 — Continued**

(Numbers in thousands)

1998 Matrix occupation	Total employment, 1998	Replacement rate (Percent)			Annual average replacement needs, 1998-2008	
		Total, 1995-96	Net, 1998-2008		Total	Net
			Annual average	10-year		
Instructors, adult (nonvocational) education .....	168	23.0	1.1	10.5	43	2
Teachers and instructors, vocational education and training .....	420	23.0	1.1	10.5	102	4
All other teachers and instructors <sup>2</sup> .....	644	21.1	1.4	13.7	146	9
Librarians, archivists, curators, and related workers .....	175	15.5	2.6	25.7	28	5
Archivists, curators, museum technicians, and conservators <sup>2</sup> .....	23	15.5	2.7	27.0	4	1
Librarians .....	152	15.5	2.6	25.5	24	4
Counselors .....	182	8.2	2.3	22.9	17	4
Health diagnosing occupations .....	892	2.8	1.7	17.3	27	15
Chiropractors <sup>2</sup> .....	46	2.8	2.1	20.6	1	1
Dentists .....	160	1.1	2.0	20.3	2	3
Optometrists <sup>2</sup> .....	38	2.8	2.1	20.6	1	1
Physicians .....	577	3.2	1.6	15.6	20	9
Podiatrists <sup>2</sup> .....	14	2.8	2.1	20.6	( <sup>1</sup> )	( <sup>1</sup> )
Veterinarians <sup>2</sup> .....	57	2.8	2.1	20.6	2	1
Health assessment and treating occupations .....	2,860	6.0	1.7	17.0	191	49
Dietitians and nutritionists .....	54	12.0	2.0	20.3	7	1
Pharmacists .....	185	2.6	2.7	27.4	5	5
Physician assistants <sup>2</sup> .....	66	3.6	1.7	16.7	3	1
Registered nurses .....	2,079	6.5	1.7	16.5	150	34
Therapists .....	476	4.6	1.5	15.0	26	7
Occupational therapists <sup>2</sup> .....	73	4.6	1.5	15.0	4	1
Physical therapists <sup>2</sup> .....	120	4.6	1.5	15.0	7	2
Radiation therapists <sup>2</sup> .....	12	4.6	1.5	15.0	1	( <sup>1</sup> )
Recreational therapists <sup>2</sup> .....	39	4.6	1.5	15.0	2	1
Respiratory therapists <sup>2</sup> .....	86	4.6	1.5	15.0	5	1
Speech-language pathologists and audiologists <sup>2</sup> .....	105	4.6	1.5	15.0	6	2
All other therapists <sup>2</sup> .....	40	4.6	1.5	15.0	2	1
Writers, artists, and entertainers .....	1,996	14.1	2.1	21.0	310	42
Actors, directors, and producers .....	160	15.3	2.2	22.4	27	4
Announcers .....	60	21.5	2.4	23.9	13	1
Artists and commercial artists .....	308	14.6	2.1	20.7	51	6
Athletes, coaches, umpires, and related workers .....	52	30.5	3.5	35.4	18	2
Dancers and choreographers <sup>2</sup> .....	29	15.4	2.2	22.4	5	1
Designers .....	423	12.8	1.5	14.6	61	6
Designers, except interior designers .....	335	12.8	1.5	14.6	49	5
Interior designers .....	53	12.8	1.5	14.6	8	1
Merchandise displayers and window dressers .....	34	12.8	1.5	14.6	5	( <sup>1</sup> )
Musicians, singers, and related workers .....	273	13.9	1.9	19.1	41	5
News analysts, reporters, and correspondents .....	67	11.3	3.1	30.7	8	2
Photographers and camera operators .....	161	12.0	1.5	14.7	20	2
Camera operators, television, motion picture, video <sup>2</sup> .....	11	12.0	1.5	14.7	2	( <sup>1</sup> )
Photographers .....	149	12.0	1.5	14.7	19	2
Public relations specialists .....	122	16.3	2.6	26.2	22	3
Writers and editors, including technical writers .....	341	11.7	2.6	26.4	45	9
All other professional workers <sup>2</sup> .....	785	13.7	2.4	24.1	119	19
<b>Technicians and related support occupations</b> .....	<b>4,949</b>	<b>8.5</b>	<b>2.2</b>	<b>22.2</b>	<b>465</b>	<b>110</b>
Health technicians and technologists .....	2,447	7.1	2.1	20.6	195	50
Cardiovascular technologists and technicians <sup>2</sup> .....	21	10.6	2.5	24.7	3	1
Clinical laboratory technologists and technicians .....	313	4.4	1.3	12.7	15	4
Dental hygienists .....	143	5.5	2.2	22.5	10	3
EKG technicians .....	12	10.6	2.5	24.7	1	( <sup>1</sup> )
Electroneurodiagnostic technologists <sup>2</sup> .....	5	10.6	2.5	24.7	1	( <sup>1</sup> )
Emergency medical technicians and paramedics <sup>2</sup> .....	150	10.6	2.5	24.7	18	4
Licensed practical and licensed vocational nurses .....	692	3.9	2.1	21.4	30	15
Medical records and health information technicians <sup>2</sup> .....	92	6.6	2.5	24.7	7	2
Nuclear medicine technologists .....	14	4.5	1.4	13.9	1	( <sup>1</sup> )
Opticians, dispensing .....	71	6.3	1.2	12.4	5	1
Pharmacy technicians <sup>2</sup> .....	109	10.6	2.5	24.7	12	3

See footnotes at end of table.

**Table 10. Total and net replacement rates and annual average replacement needs, 1998-2008 — Continued**

(Numbers in thousands)

1998 Matrix occupation	Total employment, 1998	Replacement rate (Percent)			Annual average replacement needs, 1998-2008	
		Total, 1995-96	Net, 1998-2008		Total	Net
			Annual average	10-year		
Psychiatric technicians .....	66	20.7	1.4	13.9	14	1
Radiologic technologists and technicians .....	162	4.5	1.4	13.9	8	2
Surgical technologists <sup>2</sup> .....	54	10.6	2.5	24.7	7	1
Veterinary technologists and technicians <sup>2</sup> .....	32	6.7	2.3	22.8	2	1
All other health professionals and paraprofessionals <sup>2</sup> .....	510	10.3	2.4	24.3	62	12
Engineering and science technicians and technologists .....	1,351	10.9	2.3	23.0	157	31
Engineering technicians .....	771	12.1	2.3	22.7	101	17
Electrical and electronic technicians and technologists .....	335	10.2	2.0	20.4	37	7
All other engineering technicians and technologists <sup>2</sup> .....	437	13.6	2.4	24.4	64	11
Drafters .....	283	9.5	2.4	24.0	28	7
Science and mathematics technicians <sup>2</sup> .....	227	6.7	2.3	22.8	16	5
Surveying and mapping technicians .....	69	17.8	2.3	22.7	14	2
Technicians, except health and engineering and science .....	1,152	8.5	2.5	24.9	111	29
Aircraft pilots and flight engineers .....	94	4.2	2.2	21.8	4	2
Air traffic controllers <sup>2</sup> .....	30	7.5	2.7	27.4	2	1
Broadcast and sound technicians <sup>2</sup> .....	37	7.5	2.7	27.4	3	1
Computer programmers .....	648	7.5	3.1	31.0	56	20
Legal assistants and technicians, except clerical .....	252	12.4	0.9	8.8	37	2
Paralegals and legal assistants .....	136	14.3	0.8	8.4	26	1
Title examiners, abstractors, and searchers .....	30	14.3	0.8	8.4	4	( <sup>1</sup> )
All other legal assistants, including law clerks .....	86	8.8	1.0	9.7	8	1
Library technicians <sup>2</sup> .....	72	10.4	2.7	27.4	8	2
All other technicians <sup>2</sup> .....	20	9.3	2.7	27.4	2	1
Marketing and sales occupations .....	15,341	24.6	2.9	29.5	4,057	452
Cashiers .....	3,198	35.5	4.4	43.6	1,235	139
Counter and rental clerks .....	469	36.1	4.3	43.3	189	20
Insurance sales agents .....	387	9.8	2.3	22.8	38	9
Marketing and sales worker supervisors .....	2,584	14.2	1.3	13.1	384	34
Models, demonstrators, and product promoters .....	92	23.1	2.7	27.0	25	2
Parts salespersons .....	300	11.6	2.9	28.7	35	9
Real estate agents and brokers .....	347	11.6	2.0	20.2	42	7
Brokers, real estate .....	63	11.6	2.0	20.2	8	1
Sales agents, real estate .....	285	11.6	2.0	20.2	34	6
Retail salespersons .....	4,056	28.8	3.4	33.9	1,249	137
Sales engineers .....	79	2.1	1.9	19.4	2	2
Securities, commodities, and financial services sales agents .....	303	13.3	0.8	7.6	49	2
Travel agents <sup>2</sup> .....	138	9.6	2.1	21.0	14	3
All other sales and related workers <sup>2</sup> .....	3,388	22.1	2.6	25.9	809	88
<b>Administrative support occupations, including clerical .....</b>	<b>24,461</b>	<b>18.5</b>	<b>2.0</b>	<b>20.0</b>	<b>4,730</b>	<b>490</b>
Adjusters, investigators, and collectors .....	1,237	18.8	1.5	15.1	261	19
Adjustment clerks .....	479	22.4	0.7	6.5	125	3
Bill and account collectors .....	311	26.0	2.6	26.5	95	8
Insurance claims, examining and policy processing clerks .....	339	12.5	1.5	14.7	45	5
Insurance claims clerks .....	160	6.2	1.7	16.7	11	3
Insurance examining clerks .....	10	18.0	1.3	13.0	2	( <sup>1</sup> )
Insurance policy processing clerks .....	170	18.0	1.3	13.0	32	2
Welfare eligibility workers and interviewers .....	109	1.9	2.1	21.5	2	2
Communications equipment operators .....	297	23.4	2.2	21.9	64	6
Telephone operators .....	261	23.6	2.2	21.7	57	6
Central office operators .....	23	23.6	2.2	21.7	5	1
Directory assistance operators .....	23	23.6	2.2	21.7	5	1
Switchboard operators .....	214	23.6	2.2	21.7	47	5
All other communications equipment operators <sup>2</sup> .....	36	22.3	2.3	22.6	8	1
Computer operators .....	251	14.7	1.4	14.2	32	4
Peripheral equipment operators <sup>2</sup> .....	27	15.5	1.4	14.2	3	( <sup>1</sup> )
Computer operators, except peripheral equipment .....	224	14.6	1.4	14.2	29	3
Information clerks .....	1,910	24.3	2.3	22.6	511	43
Hotel, motel, and resort desk clerks .....	159	34.4	3.8	38.4	58	6
Interviewing clerks, except personnel and social welfare .....	128	29.0	3.2	32.2	42	4
New accounts clerks, banking .....	111	29.0	3.2	32.2	35	4

See footnotes at end of table.

**Table 10. Total and net replacement rates and annual average replacement needs, 1998-2008 — Continued**

(Numbers in thousands)

1998 Matrix occupation	Total employment, 1998	Replacement rate (Percent)			Annual average replacement needs, 1998-2008	
		Total, 1995-96	Net, 1998-2008		Total	Net
			Annual average	10-year		
Receptionists and information clerks .....	1,293	24.6	1.9	19.1	356	25
Reservation and transportation ticket agents and travel clerks <sup>2</sup> .....	219	9.6	2.1	21.0	22	5
Mail clerks and messengers .....	247	22.9	2.4	23.7	59	6
Couriers and messengers .....	120	27.2	2.4	23.7	34	3
Mail clerks, except mail machine operators and postal service .....	128	18.9	2.4	23.7	25	3
Postal clerks and mail carriers .....	405	2.2	2.6	26.0	9	11
Postal mail carriers .....	332	1.4	2.8	28.1	5	9
Postal service clerks .....	73	5.7	1.6	16.3	4	1
Material recording, scheduling, dispatching, and distributing occupations .....	4,183	20.0	1.6	16.4	855	69
Dispatchers .....	248	17.1	1.6	16.3	45	4
Dispatchers, except police, fire, and ambulance .....	163	17.1	1.6	16.3	30	3
Dispatchers, police, fire, and ambulance .....	85	17.1	1.6	16.3	15	1
Meter readers, utilities <sup>2</sup> .....	50	22.5	2.5	25.2	11	1
Procurement clerks .....	58	18.2	1.5	15.1	10	1
Production, planning, and expediting clerks .....	248	24.8	1.2	11.8	62	3
Shipping, receiving, and traffic clerks .....	1,000	23.6	1.7	16.6	240	17
Stock clerks and order fillers .....	2,331	17.9	1.6	16.0	429	37
Weighers, measurers, checkers, and samplers, recordkeeping <sup>2</sup> .....	51	22.5	2.5	25.2	11	1
All other material recording, scheduling, and distribution workers <sup>2</sup> .....	196	23.2	2.3	22.6	47	4
Records processing occupations .....	3,731	17.5	2.1	21.5	656	80
Advertising clerks <sup>2</sup> .....	14	15.1	2.4	23.9	2	( <sup>1</sup> )
Brokerage clerks .....	77	18.0	1.3	13.0	16	1
Correspondence clerks <sup>2</sup> .....	25	15.1	2.4	23.9	4	1
File clerks .....	272	40.3	3.5	34.8	115	9
Financial records processing occupations .....	2,698	15.3	1.9	18.9	410	51
Billing, cost, and rate clerks .....	342	15.9	2.0	19.9	58	7
Billing and posting clerks and machine operators <sup>2</sup> .....	107	10.2	2.0	19.8	11	2
Bookkeeping, accounting, and auditing clerks .....	2,078	16.0	1.9	18.7	325	39
Payroll and timekeeping clerks .....	172	9.3	2.0	19.9	15	3
Library assistants and bookmobile drivers .....	127	24.7	4.9	48.6	34	6
Order clerks .....	362	15.1	2.4	23.9	56	9
Human resources assistants, except payroll and timekeeping .....	142	15.1	1.9	18.9	22	3
Statement clerks .....	16	18.0	1.3	13.0	3	( <sup>1</sup> )
Secretaries, stenographers, and typists .....	3,764	13.6	1.7	16.7	511	63
Court reporters, medical transcriptionists, and stenographers <sup>2</sup> .....	110	12.6	1.6	16.3	15	2
Secretaries .....	3,195	13.3	1.6	16.3	430	52
Legal secretaries .....	285	13.3	1.6	16.3	40	5
Medical secretaries .....	219	13.3	1.6	16.3	31	4
Secretaries, except legal and medical .....	2,690	13.3	1.6	16.3	358	44
Word processors and typists .....	459	15.8	1.9	19.5	65	9
Other clerical and administrative support workers .....	8,436	19.7	2.3	22.5	1,792	190
Bank tellers .....	560	19.6	4.3	42.9	107	24
Court, municipal, and license clerks .....	100	23.8	1.6	16.1	25	2
Court clerks .....	51	23.8	1.6	16.1	13	1
License clerks .....	24	23.8	1.6	16.1	6	( <sup>1</sup> )
Municipal clerks .....	25	23.8	1.6	16.1	6	( <sup>1</sup> )
Credit and loan authorizers, checkers, and clerks .....	254	23.2	1.0	9.9	61	3
Credit authorizers .....	17	23.1	1.2	11.5	4	( <sup>1</sup> )
Credit checkers .....	41	22.4	0.7	6.5	9	( <sup>1</sup> )
Loan and credit clerks .....	179	23.4	1.1	10.5	44	2
Loan interviewers .....	16	23.4	1.1	10.5	4	( <sup>1</sup> )
Data entry keyers .....	435	22.8	0.8	7.6	104	3
Duplicating, mail, and other office machine operators <sup>2</sup> .....	197	21.3	3.0	29.5	42	6
Office and administrative support supervisors and managers .....	1,611	11.7	2.3	22.5	207	36
Office clerks, general .....	3,021	21.5	2.8	27.7	699	84
Proofreaders and copy markers <sup>2</sup> .....	41	22.5	3.1	30.9	9	1
Statistical clerks .....	72	7.5	1.4	13.5	5	1
Teacher assistants .....	1,192	22.2	1.1	11.5	306	14
All other clerical and administrative support workers .....	953	21.9	1.8	17.8	227	17

See footnotes at end of table.

**Table 10. Total and net replacement rates and annual average replacement needs, 1998-2008 — Continued**

(Numbers in thousands)

1998 Matrix occupation	Total employment, 1998	Replacement rate (Percent)			Annual average replacement needs, 1998-2008	
		Total, 1995-96	Net, 1998-2008		Total	Net
			Annual average	10-year		
<b>Service occupations</b> .....	22,548	25.8	3.1	31.4	6,317	708
Cleaning and building service occupations, except private household .....	3,623	20.4	2.1	20.9	781	76
Institutional cleaning supervisors .....	87	8.8	2.3	23.4	8	2
Janitors and cleaners, including maids and housekeeping cleaners .....	3,184	20.8	2.1	20.8	699	66
Pest control workers <sup>2</sup> .....	52	11.4	2.3	22.7	7	1
All other cleaning and building service workers <sup>2</sup> .....	300	21.4	2.1	21.0	66	6
<b>Food preparation and service occupations</b> .....	8,735	35.4	4.7	46.5	3,282	406
Chefs, cooks, and other kitchen workers .....	3,306	32.8	3.7	37.1	1,157	123
Cooks, except short order .....	1,373	29.0	2.6	26.1	424	36
Bakers, bread and pastry .....	171	29.0	2.6	26.1	54	4
Cooks, institution or cafeteria .....	418	29.0	2.6	26.1	123	11
Cooks, restaurant .....	783	29.0	2.6	26.1	248	20
Cooks, short order and fast food .....	677	29.0	2.6	26.1	214	18
Food preparation workers <sup>2</sup> .....	1,256	39.1	5.5	55.1	516	69
<b>Food and beverage service occupations</b> .....	5,150	36.9	5.3	53.0	2,018	273
Bartenders .....	404	20.8	4.3	42.8	85	17
Dining room and cafeteria attendants and bar helpers .....	405	43.6	3.0	30.5	180	12
Food counter, fountain, and related workers <sup>2</sup> .....	2,025	42.8	6.1	60.7	920	123
Hosts and hostesses, restaurant, lounge, or coffee shop .....	297	32.5	3.1	30.5	105	9
Waiters and waitresses .....	2,019	33.5	5.5	55.1	728	111
All other food preparation and service workers .....	280	36.6	3.8	38.5	107	11
<b>Health service occupations</b> .....	2,309	18.1	1.7	16.8	480	39
Ambulance drivers and attendants, except EMTs .....	19	15.5	2.3	23.4	4	( <sup>1</sup> )
Dental assistants .....	229	16.9	1.5	15.3	47	3
Medical assistants <sup>2</sup> .....	252	10.6	2.5	24.7	34	6
Nursing and psychiatric aides .....	1,461	20.7	1.4	13.9	338	20
Nursing aides, orderlies, and attendants .....	1,367	20.7	1.4	13.9	317	19
Psychiatric aides .....	95	20.7	1.4	13.9	20	1
Occupational therapy assistants and aides <sup>2</sup> .....	19	10.6	2.5	24.7	2	( <sup>1</sup> )
Pharmacy aides <sup>2</sup> .....	61	12.4	2.5	24.5	8	2
Physical therapy assistants and aides .....	82	10.6	2.5	24.7	11	2
All other health service workers .....	185	15.5	2.3	23.4	32	4
<b>Personal service occupations</b> .....	2,934	22.0	1.8	17.6	745	52
Amusement and recreation attendants .....	337	33.9	1.8	18.3	132	6
Baggage porters and bellhops <sup>2</sup> .....	40	22.9	1.8	18.3	10	1
Child care workers .....	905	29.8	1.0	9.8	305	9
Barbers, cosmetologists, and related workers .....	723	10.0	2.6	25.9	76	19
Barbers .....	54	3.7	2.8	28.1	2	2
Hairdressers, hairstylists, and cosmetologists .....	605	10.5	2.6	25.8	67	16
Manicurists .....	49	10.5	2.6	25.8	6	1
Shampooers .....	15	10.5	2.6	25.8	2	( <sup>1</sup> )
Flight attendants .....	99	2.1	2.1	21.4	2	2
Personal care and home health aides <sup>2</sup> .....	746	21.4	1.8	17.9	206	13
Ushers, lobby attendants, and ticket takers <sup>2</sup> .....	84	22.9	1.8	18.3	21	2
<b>Private household workers</b> .....	928	33.4	3.0	29.7	280	28
Child care workers, private household .....	306	44.7	4.6	45.7	115	14
Cleaners and servants, private household <sup>2</sup> .....	600	27.8	2.2	21.8	157	13
Cooks, private household <sup>2</sup> .....	5	27.8	2.2	21.8	1	( <sup>1</sup> )
Housekeepers and butlers <sup>2</sup> .....	17	27.8	2.2	21.8	4	( <sup>1</sup> )
<b>Protective service occupations</b> .....	2,769	12.6	2.8	27.9	394	77
Fire fighting occupations .....	314	5.5	2.6	26.4	18	8
Firefighters .....	239	3.6	2.5	24.6	9	6
Fire fighting and prevention supervisors <sup>2</sup> .....	60	13.5	3.3	33.4	9	2
Fire inspection occupations .....	15	4.1	2.6	26.4	1	( <sup>1</sup> )
<b>Law enforcement occupations</b> .....	1,147	8.1	2.5	25.2	107	29
Correctional officers .....	383	10.9	2.7	27.4	50	11
Police and detectives .....	727	6.9	2.5	24.8	57	18
Detectives and criminal investigators .....	79	7.3	2.7	26.6	6	2
Police and detective supervisors .....	111	10.8	2.9	29.0	13	3

See footnotes at end of table.

**Table 10. Total and net replacement rates and annual average replacement needs, 1998-2008 — Continued**

(Numbers in thousands)

1998 Matrix occupation	Total employment, 1998	Replacement rate (Percent)			Annual average replacement needs, 1998-2008	
		Total, 1995-96	Net, 1998-2008		Total	Net
			Annual average	10-year		
Police patrol officers .....	446	7.3	2.7	26.6	38	12
Sheriffs and deputy sheriffs .....	91	0.0	0.9	9.2	( <sup>1</sup> )	1
Other law enforcement occupations .....	37	2.3	1.1	11.1	1	( <sup>1</sup> )
Other protective service workers .....	1,308	18.2	3.1	30.6	270	40
Crossing guards <sup>2</sup> .....	54	17.6	2.9	29.2	10	2
Guards .....	1,027	19.4	2.5	24.9	227	26
Private detectives and investigators .....	61	19.4	2.5	24.9	13	2
All other protective service workers .....	166	11.0	6.8	68.3	20	11
All other service workers <sup>2</sup> .....	1,249	21.6	2.4	24.4	295	30
<b>Agriculture, forestry, fishing, and related occupations</b> .....	<b>4,435</b>	<b>16.4</b>	<b>2.3</b>	<b>23.3</b>	<b>735</b>	<b>104</b>
Farm operators and managers .....	1,483	10.4	1.6	15.6	145	23
Farmers .....	1,308	10.9	1.5	15.5	133	20
Farm managers .....	175	6.6	1.7	16.8	11	3
Farm workers .....	851	19.1	3.1	30.7	157	26
Fishers and fishing vessel operators .....	51	23.1	2.0	19.8	10	1
Captains and other officers, fishing vessels <sup>2</sup> .....	11	23.1	2.0	19.8	2	( <sup>1</sup> )
Fishers <sup>2</sup> .....	40	23.1	2.0	19.8	8	1
Forestry, conservation, and logging occupations .....	120	15.2	2.2	22.5	18	3
Forest and conservation workers <sup>2</sup> .....	33	16.0	2.2	22.0	5	1
Timber cutting and logging occupations .....	87	14.9	2.3	22.7	13	2
Fallers and buckers .....	18	14.3	2.5	25.3	2	( <sup>1</sup> )
Logging equipment operators .....	56	15.3	2.1	21.2	8	1
All other timber cutting and related logging workers .....	13	14.3	2.5	25.3	2	( <sup>1</sup> )
Landscaping, groundskeeping, nursery, greenhouse, and lawn service occupations .....	1,285	20.0	2.8	28.2	284	36
Laborers, landscaping and groundskeeping .....	1,130	20.8	3.0	29.8	260	34
Lawn service managers <sup>2</sup> .....	86	9.1	0.8	7.9	9	1
Nursery and greenhouse managers <sup>2</sup> .....	5	9.1	0.8	7.9	1	( <sup>1</sup> )
Pruners .....	45	20.8	3.0	29.8	10	1
Sprayers/applicators .....	19	22.5	2.9	29.0	5	1
Supervisors, farming, forestry, and agricultural related occupations <sup>2</sup> .....	92	11.9	1.4	13.7	11	1
Veterinary assistants and nonfarm animal caretakers .....	181	26.6	1.4	14.4	54	3
Animal caretakers, except farm .....	137	26.6	1.4	14.4	40	2
Veterinary assistants .....	45	26.6	1.4	14.4	14	1
All other agricultural, forestry, fishing, and related workers <sup>2</sup> .....	373	18.8	2.9	28.7	71	11
<b>Precision production, craft, and repair occupations</b> .....	<b>15,619</b>	<b>12.2</b>	<b>2.4</b>	<b>23.6</b>	<b>1,982</b>	<b>368</b>
Blue-collar worker supervisors <sup>2</sup> .....	2,198	8.6	2.8	27.6	196	61
Construction trades .....	4,628	15.0	2.2	22.4	723	103
Boilermakers .....	18	11.2	2.4	24.4	2	( <sup>1</sup> )
Bricklayers, blockmasons, and stonemasons <sup>2</sup> .....	157	16.7	2.0	20.4	28	3
Carpenters .....	1,071	20.6	2.7	26.8	229	29
Carpet, floor, and tile installers and finishers .....	138	14.1	2.3	23.2	20	3
Carpet installers .....	85	12.7	2.2	21.8	11	2
Hard tile setters <sup>2</sup> .....	29	17.0	2.6	25.7	5	1
All other carpet, floor, and tile installers and finishers .....	25	15.7	2.5	25.2	4	1
Ceiling tile installers and acoustical carpenters .....	16	20.6	2.7	26.8	3	( <sup>1</sup> )
Concrete finishers, cement masons, and terrazzo workers .....	139	9.2	1.2	11.9	13	2
Construction equipment operators .....	321	10.9	1.6	15.9	36	5
Grader, bulldozer, and scraper operators .....	122	4.0	0.8	7.9	5	1
Operating engineers .....	126	14.2	1.8	17.9	19	2
Paving, surfacing, and tamping equipment operators <sup>2</sup> .....	74	16.7	2.6	25.7	13	2
Drywall installers and finishers .....	163	18.7	1.3	13.4	32	2
Electricians .....	656	12.5	2.0	20.5	86	13
Elevator installers and repairers .....	30	15.0	2.5	25.3	5	1
Glaziers <sup>2</sup> .....	44	16.7	2.6	25.7	8	1
Hazardous materials removal workers .....	38	11.5	2.4	23.7	5	1
Highway maintenance workers .....	155	11.5	2.4	23.7	19	4
Insulation workers .....	67	9.4	3.2	32.3	7	2
Painters and paperhangers .....	476	16.6	2.6	25.6	82	12

See footnotes at end of table.

**Table 10. Total and net replacement rates and annual average replacement needs, 1998-2008 — Continued**

(Numbers in thousands)

1998 Matrix occupation	Total employment, 1998	Replacement rate (Percent)			Annual average replacement needs, 1998-2008	
		Total, 1995-96	Net, 1998-2008		Total	Net
			Annual average	10-year		
Pipelayers and pipelaying fitters <sup>2</sup> .....	57	11.5	2.4	23.7	7	1
Plasterers and stucco masons <sup>2</sup> .....	40	16.7	2.6	25.7	7	1
Plumbers, pipefitters, and steamfitters .....	426	12.8	1.2	12.5	56	5
Roofers .....	158	16.1	3.4	34.3	27	5
Sheet metal workers and duct installers .....	230	7.9	2.5	24.6	19	6
Structural and reinforcing metal workers .....	81	16.3	2.6	26.5	14	2
All other construction trades workers <sup>2</sup> .....	146	11.5	2.4	23.7	17	3
Extractive and related workers, including blasters .....	244	6.8	2.5	25.0	17	6
Oil and gas extraction occupations .....	69	5.9	2.5	25.0	4	2
Roustabouts, oil and gas <sup>2</sup> .....	30	5.9	2.5	25.0	2	1
All other oil and gas extraction occupations <sup>2</sup> .....	40	5.9	2.5	25.0	2	1
Mining, quarrying, and tunneling occupations <sup>2</sup> .....	23	5.9	2.5	25.0	1	1
All other extraction and related workers <sup>2</sup> .....	152	7.3	2.5	25.1	12	4
Mechanics, installers, and repairers .....	5,176	11.5	2.4	23.9	629	123
Electrical and electronic equipment mechanics, installers, and repairers .....	409	10.0	2.5	25.1	44	10
Computer, automated teller, and office machine repairers .....	138	11.0	1.7	17.2	18	2
Data processing equipment repairers .....	79	16.7	1.4	14.2	16	1
Office machine and cash register servicers .....	58	3.2	2.1	21.3	2	1
Telecommunications equipment mechanics, installers, and repairers .....	125	8.0	3.1	31.0	11	4
Radio mechanics .....	7	11.6	2.8	28.2	1	( <sup>1</sup> )
Telephone equipment installers and repairers .....	69	6.2	3.2	32.5	4	2
Central office and PBX installers and repairers <sup>2</sup> .....	44	6.2	3.2	32.5	3	1
Station installers and repairers, telephone <sup>2</sup> .....	24	6.2	3.2	32.5	1	1
All other telecommunications equipment mechanics, installers, and repairers <sup>2</sup> .....	49	10.1	2.9	29.4	5	1
Miscellaneous electrical and electronic equipment mechanics, installers, and repairers .....	146	10.7	2.8	27.7	16	4
Electronic home entertainment equipment repairers .....	36	11.6	2.8	28.2	4	1
Electronics repairers, commercial and industrial equipment .....	72	11.6	2.8	28.2	9	2
All other electrical and electronic equipment mechanics, installers, and repairers .....	39	8.0	2.6	26.4	3	1
Machinery mechanics, installers, and repairers .....	1,850	11.0	2.3	22.6	210	42
Industrial machinery mechanics <sup>2</sup> .....	535	6.3	2.3	22.5	34	12
Maintenance repairers, general utility .....	1,232	13.4	2.2	22.4	171	28
Millwrights .....	82	6.2	2.7	27.1	5	2
Vehicle and mobile equipment mechanics and repairers .....	1,612	11.5	2.5	24.8	197	40
Aircraft mechanics and service technicians <sup>2</sup> .....	133	7.1	2.0	20.0	10	3
Automotive body and related repairers .....	227	12.0	2.9	29.2	29	7
Automotive mechanics and service technicians .....	790	12.4	2.5	24.9	106	20
Bus and truck mechanics and diesel engine specialists .....	255	7.1	2.2	21.9	19	6
Farm equipment mechanics <sup>2</sup> .....	49	15.8	2.6	26.1	8	1
Mobile heavy equipment mechanics .....	106	15.8	2.6	26.1	18	3
Motorcycle, boat, and small engine mechanics .....	52	14.6	2.6	25.8	8	1
Motorcycle mechanics <sup>2</sup> .....	14	14.6	2.6	25.8	2	( <sup>1</sup> )
Small engine mechanics <sup>2</sup> .....	38	14.6	2.6	25.8	6	1
Other mechanics, installers, and repairers .....	1,305	12.7	2.4	24.1	178	31
Bicycle repairers .....	11	13.4	2.2	22.4	2	( <sup>1</sup> )
Camera and photographic equipment repairers <sup>2</sup> .....	9	15.0	2.5	25.3	1	( <sup>1</sup> )
Coin, vending, and amusement machine servicers and repairers .....	27	13.4	2.2	22.4	4	1
Heating, air conditioning, and refrigeration mechanics and installers .....	286	8.0	1.8	18.5	25	5
Home appliance and power tool repairers <sup>2</sup> .....	51	14.1	3.0	29.6	7	2
Line installers and repairers .....	279	5.9	2.9	29.3	18	8
Electrical powerline installers and repairers <sup>2</sup> .....	99	5.5	2.3	23.4	6	2
Telephone and cable TV line installers and repairers .....	180	6.2	3.2	32.5	13	6
Locksmiths and safe repairers <sup>2</sup> .....	27	15.0	2.5	25.3	4	1
Medical equipment repairers .....	11	13.4	2.2	22.4	2	( <sup>1</sup> )
Musical instrument repairers and tuners <sup>2</sup> .....	13	15.0	2.5	25.3	2	( <sup>1</sup> )
Precision instrument repairers <sup>2</sup> .....	33	15.0	2.5	25.3	5	1
Riggers .....	11	13.4	2.2	22.4	2	( <sup>1</sup> )
Tire repairers and changers .....	83	28.8	4.4	43.8	25	4
Watch repairers <sup>2</sup> .....	8	15.0	2.5	25.3	1	( <sup>1</sup> )
All other mechanics, installers, and repairers <sup>2</sup> .....	455	16.2	2.0	20.2	79	9

See footnotes at end of table.

**Table 10. Total and net replacement rates and annual average replacement needs, 1998-2008 — Continued**

(Numbers in thousands)

1998 Matrix occupation	Total employment, 1998	Replacement rate (Percent)			Annual average replacement needs, 1998-2008	
		Total, 1995-96	Net, 1998-2008		Total	Net
			Annual average	10-year		
Production occupations, precision .....	2,971	12.8	2.1	21.2	383	63
Assemblers, precision .....	422	15.4	2.3	22.8	66	10
Aircraft assemblers, precision <sup>2</sup> .....	17	11.2	2.4	24.4	2	( <sup>1</sup> )
Electrical and electronic equipment assemblers, precision .....	201	18.1	2.2	21.8	38	4
Electromechanical equipment assemblers, precision .....	50	18.1	2.2	21.8	9	1
Fitters, structural metal, precision <sup>2</sup> .....	17	11.2	2.4	24.4	2	( <sup>1</sup> )
Machine builders and other precision machine assemblers <sup>2</sup> .....	74	11.2	2.4	24.4	8	2
All other precision assemblers <sup>2</sup> .....	64	11.4	2.4	24.4	7	2
Food workers, precision .....	310	11.5	2.3	22.6	35	7
Bakers, manufacturing .....	55	19.1	1.2	12.5	11	1
Butchers and meatcutters .....	216	8.7	2.4	23.7	18	5
All other precision food and tobacco workers <sup>2</sup> .....	39	16.8	3.1	31.0	7	1
Inspectors, testers, and graders, precision .....	689	14.1	2.2	22.2	96	15
Metal workers, precision <sup>2</sup> .....	707	9.8	2.0	20.5	71	14
Jewelers and precious stone and metal workers <sup>2</sup> .....	30	11.2	2.4	24.4	3	1
Machinists .....	426	9.0	2.0	19.9	40	8
Numerical control machine tool programmers .....	8	7.5	2.7	27.4	1	( <sup>1</sup> )
Shipfitters <sup>2</sup> .....	9	11.2	2.4	24.4	1	( <sup>1</sup> )
Tool and die makers .....	138	11.2	1.9	18.5	15	3
All other precision metal workers <sup>2</sup> .....	97	10.7	2.3	23.4	11	2
Printing workers, precision .....	138	16.2	1.8	17.8	22	2
Bookbinders <sup>2</sup> .....	7	16.5	2.7	27.5	1	( <sup>1</sup> )
Prepress printing workers, precision .....	115	16.2	1.7	17.4	18	2
Camera operators <sup>2</sup> .....	9	16.3	1.7	17.1	1	( <sup>1</sup> )
Compositors and typesetters, precision <sup>2</sup> .....	14	16.3	1.7	17.1	2	( <sup>1</sup> )
Desktop publishing specialists <sup>2</sup> .....	26	16.3	1.7	17.1	6	( <sup>1</sup> )
Film strippers, printing <sup>2</sup> .....	23	16.3	1.7	17.1	3	( <sup>1</sup> )
Job printers .....	17	15.4	1.9	19.1	3	( <sup>1</sup> )
Paste-up workers <sup>2</sup> .....	9	16.3	1.7	17.1	1	( <sup>1</sup> )
Photoengravers <sup>2</sup> .....	3	16.3	1.7	17.1	( <sup>1</sup> )	( <sup>1</sup> )
Platemakers <sup>2</sup> .....	15	16.3	1.7	17.1	2	( <sup>1</sup> )
All other printing workers, precision <sup>2</sup> .....	17	16.3	1.7	17.1	3	( <sup>1</sup> )
Textile, apparel, and furnishings workers, precision .....	234	10.0	2.0	19.7	23	5
Custom tailors and sewers .....	74	9.0	1.9	18.8	6	1
Patternmakers and layout workers, fabric and apparel <sup>2</sup> .....	16	8.1	2.0	19.9	1	( <sup>1</sup> )
Shoe and leather workers and repairers, precision <sup>2</sup> .....	23	8.1	2.0	19.9	2	( <sup>1</sup> )
Upholsterers <sup>2</sup> .....	66	8.1	2.1	20.6	5	1
All other precision textile, apparel, and furnishings workers <sup>2</sup> .....	55	14.9	2.0	19.6	8	1
Woodworkers, precision .....	229	14.7	1.5	15.2	34	3
Cabinetmakers and bench carpenters .....	123	15.3	1.1	11.4	19	1
Furniture finishers <sup>2</sup> .....	38	13.4	2.4	24.4	5	1
Wood machinists .....	40	15.3	1.1	11.4	6	( <sup>1</sup> )
All other precision woodworkers <sup>2</sup> .....	27	13.4	2.4	24.4	4	1
Other precision workers .....	242	14.2	2.5	24.9	36	6
Dental laboratory technicians, precision .....	44	7.6	1.9	19.3	3	1
Ophthalmic laboratory technicians .....	23	6.3	1.2	12.4	1	( <sup>1</sup> )
Photographic process workers, precision .....	18	23.2	4.0	39.7	4	1
All other precision workers .....	157	16.1	2.6	26.5	27	4
Plant and system occupations .....	403	7.6	2.9	29.0	32	12
Chemical plant and system operators <sup>2</sup> .....	43	6.6	3.2	32.0	3	1
Electric power generating plant operators, distributors, and dispatchers .....	45	6.6	3.2	32.0	3	1
Power distributors and dispatchers <sup>2</sup> .....	14	6.6	3.2	32.0	1	( <sup>1</sup> )
Power generating and reactor plant operators <sup>2</sup> .....	31	6.6	3.2	32.0	2	1
Gas and petroleum plant and system occupations <sup>2</sup> .....	38	6.6	3.2	32.0	2	1
Stationary engineers .....	31	6.2	2.1	21.3	2	1
Water and liquid waste treatment plant and system operators .....	98	10.8	2.3	23.2	11	2
All other plant and system operators <sup>2</sup> .....	148	6.6	3.2	32.0	10	5
<b>Operators, fabricators, and laborers .....</b>	<b>18,588</b>	<b>19.2</b>	<b>2.3</b>	<b>23.2</b>	<b>3,734</b>	<b>430</b>
Machine setters, set-up operators, operators, and tenders .....	5,139	14.9	2.1	21.0	774	108

See footnotes at end of table.

**Table 10. Total and net replacement rates and annual average replacement needs, 1998-2008 — Continued**

(Numbers in thousands)

1998 Matrix occupation	Total employment, 1998	Replacement rate (Percent)			Annual average replacement needs, 1998-2008	
		Total, 1995-96	Net, 1998-2008		Total	Net
			Annual average	10-year		
Numerical control machine tool operators and tenders, metal and plastic <sup>2</sup> .....	88	17.3	2.2	22.1	17	2
Combination machine tool setters, set-up operators, operators, and tenders, metal and plastic <sup>2</sup> .....	107	17.3	2.2	22.1	20	2
Machine tool cut and form setters, operators, and tenders, metal and plastic .....	726	11.5	2.4	23.6	82	17
Drilling and boring machine tool setters and set-up operators, metal and plastic <sup>2</sup> .....	42	17.3	2.2	22.1	7	1
Grinding, lapping, and buffing machine tool setters and set-up operators, metal and plastic .....	75	5.6	2.7	26.9	4	2
Lathe and turning machine tool setters and set-up operators, metal and plastic <sup>2</sup> .....	72	17.3	2.2	22.1	12	2
Machine forming operators and tenders, metal and plastic .....	163	9.9	2.5	24.9	16	4
Machine tool cutting operators and tenders, metal and plastic .....	109	5.9	2.5	25.3	6	3
Punching machine setters and set-up operators, metal and plastic .....	47	12.4	2.0	20.1	6	1
All other machine tool setters, set-up operators, metal and plastic <sup>2</sup> .....	218	14.4	2.2	22.2	32	5
Metal fabricating machine setters, operators, and related workers .....	167	12.0	2.4	24.3	21	4
Metal fabricators, structural metal products <sup>2</sup> .....	46	17.3	2.2	22.1	8	1
Soldering and brazing machine operators and tenders <sup>2</sup> .....	12	18.5	2.3	23.3	2	( <sup>1</sup> )
Welding machine setters, operators, and tenders .....	110	9.1	2.5	25.3	10	3
Metal and plastic processing machine setters, operators, and related workers .....	478	9.9	2.4	24.5	50	12
Electrolytic plating machine setters, set-up operators, operators, and tenders, metal and plastic <sup>2</sup> .....	45	9.9	2.5	24.9	5	1
Foundry mold assembly and shake out workers .....	9	9.9	2.5	24.9	1	( <sup>1</sup> )
Furnace operators and tenders <sup>2</sup> .....	23	10.0	1.6	15.7	2	( <sup>1</sup> )
Heat treating, annealing, and tempering machine operators and tenders, metal and plastic <sup>2</sup> .....	23	9.9	2.5	24.9	2	1
Metal molding machine setters, set-up operators, operators, and tenders .....	58	9.9	2.5	24.9	6	1
Plastic molding machine setters, set-up operators, operators, and tenders .....	171	9.9	2.5	24.9	18	4
All other metal and plastic machine setters, operators, and related workers <sup>2</sup> .....	148	9.9	2.5	24.9	16	4
Printing, binding, and related workers .....	406	15.0	2.0	20.1	61	8
Bindery machine operators and set-up operators <sup>2</sup> .....	90	16.3	1.7	17.1	15	2
Prepress printing workers, production <sup>2</sup> .....	20	16.3	1.7	17.1	3	( <sup>1</sup> )
Photoengraving and lithographic machine operators and tenders <sup>2</sup> .....	7	16.3	1.7	17.1	1	( <sup>1</sup> )
Typesetting and composing machine operators and tenders <sup>2</sup> .....	13	16.3	1.7	17.1	2	( <sup>1</sup> )
Printing press operators .....	225	14.3	2.2	21.7	32	5
Letterpress operators .....	10	14.3	2.2	21.7	1	( <sup>1</sup> )
Offset lithographic press operators .....	63	14.3	2.2	21.7	8	1
Printing press machine setters, operators and tenders .....	142	14.3	2.2	21.7	21	3
All other printing press setters and set-up operators <sup>2</sup> .....	10	14.3	2.2	21.7	1	( <sup>1</sup> )
Screen printing machine setters and set-up operators .....	28	14.3	2.2	21.7	4	1
All other printing, binding, and related workers .....	43	15.7	1.8	18.4	7	1
Textile and related setters, operators, and related workers .....	851	13.9	1.5	14.9	107	13
Extruding and forming machine operators and tenders, synthetic or glass fibers <sup>2</sup> .....	33	17.2	1.6	16.5	6	1
Pressing machine operators and tenders, textile, garment, and related materials .....	69	15.2	1.7	16.6	10	1
Sewing machine operators, garment .....	369	13.5	1.4	13.7	42	5
Sewing machine operators, non-garment .....	137	13.5	1.4	13.7	19	2
Textile bleaching and dyeing machine operators and tenders <sup>2</sup> .....	24	17.2	1.6	16.5	4	( <sup>1</sup> )
Textile draw-out and winding machine operators and tenders <sup>2</sup> .....	192	13.6	1.7	16.6	23	3
Textile machine setters and set-up operators .....	28	13.4	1.7	16.7	4	( <sup>1</sup> )
Woodworking machine setters, operators, and other related workers .....	143	32.9	2.6	26.0	45	4
Head sawyers and sawing machine operators and tenders, setters and set-up operators .....	64	37.5	2.9	29.4	24	2
Woodworking machine operators and tenders, setters and set-up operators <sup>2</sup> .....	79	29.1	2.3	23.2	21	2
Other machine setters, set-up operators, operators, and tenders .....	2,172	16.4	2.1	21.2	373	46
Boiler operators and tenders, low pressure <sup>2</sup> .....	16	6.2	2.1	21.3	1	( <sup>1</sup> )
Cement and gluing machine operators and tenders <sup>2</sup> .....	32	17.6	2.4	23.7	5	1
Chemical equipment controllers, operators and tenders <sup>2</sup> .....	100	17.6	2.4	23.7	19	2
Cooking and roasting machine operators and tenders, food and tobacco <sup>2</sup> .....	31	13.0	1.8	18.3	4	1
Crushing, grinding, mixing, and blending machine operators and tenders .....	150	17.6	2.3	23.5	27	4
Cutting and slicing machine setters, operators and tenders .....	96	17.9	2.4	24.1	18	2
Dairy processing equipment operators, including setters .....	15	17.6	2.4	23.7	2	( <sup>1</sup> )
Electronic semiconductor processors .....	63	10.0	1.5	14.8	8	1
Extruding and forming machine setters, operators and tenders <sup>2</sup> .....	126	17.6	2.4	23.7	23	3
Furnace, kiln, oven, drier, or kettle operators and tenders <sup>2</sup> .....	25	10.0	1.6	15.7	2	( <sup>1</sup> )

See footnotes at end of table.

**Table 10. Total and net replacement rates and annual average replacement needs, 1998-2008 — Continued**

(Numbers in thousands)

1998 Matrix occupation	Total employment, 1998	Replacement rate (Percent)			Annual average replacement needs, 1998-2008	
		Total, 1995-96	Net, 1998-2008		Total	Net
			Annual average	10-year		
Laundry and dry-cleaning machine operators and tenders, except pressing .....	167	20.8	2.5	24.5	36	4
Motion picture projectionists <sup>2</sup> .....	9	17.6	2.4	23.7	1	( <sup>1</sup> )
Packaging and filling machine operators and tenders .....	377	20.8	2.6	26.0	83	10
Painting and coating machine operators .....	171	18.8	2.2	21.8	34	4
Coating, painting, and spraying machine operators, tenders, setters, and set-up operators .....	129	18.8	2.2	21.8	25	3
Painters, transportation equipment .....	42	18.8	2.2	21.8	8	1
Paper goods machine setters and set-up operators <sup>2</sup> .....	62	15.4	2.1	21.1	9	1
Photographic processing machine operators and tenders .....	46	23.2	4.0	39.7	10	2
Separating, filtering, clarifying, precipitating, and still machine operators and tenders <sup>2</sup> .....	28	17.6	2.4	23.7	5	1
Shoe sewing machine operators and tenders <sup>2</sup> .....	7	13.5	1.8	18.4	1	( <sup>1</sup> )
Tire building machine operators .....	18	10.0	1.5	14.8	2	( <sup>1</sup> )
All other machine operators, tenders, setters, and set-up operators <sup>2</sup> .....	635	12.0	1.5	14.9	82	9
Hand workers, including assemblers and fabricators .....	3,092	18.7	2.1	21.5	606	66
Cannery workers .....	50	20.8	2.6	26.0	10	1
Coil winders, tapers, and finishers .....	22	22.2	1.8	17.9	5	( <sup>1</sup> )
Cutters and trimmers, hand <sup>2</sup> .....	42	18.5	2.3	23.3	7	1
Electrical and electronic assemblers .....	246	22.2	1.8	17.9	57	4
Grinders and polishers, hand .....	81	15.8	2.7	26.9	13	2
Machine assemblers .....	67	22.2	1.8	17.9	15	1
Meat, poultry, and fish cutters and trimmers, hand <sup>2</sup> .....	143	18.5	2.3	23.3	30	3
Painting, coating, and decorating workers, hand <sup>2</sup> .....	39	18.5	2.3	23.3	8	1
Pressers, hand .....	13	15.8	2.7	26.9	2	( <sup>1</sup> )
Sewers, hand .....	10	9.0	1.9	18.8	1	( <sup>1</sup> )
Solderers and brazers .....	35	18.5	2.3	23.3	7	1
Welders and cutters .....	368	9.1	2.5	25.3	35	9
All other assemblers, fabricators, and hand workers <sup>2</sup> .....	1,976	20.1	2.1	20.8	417	41
Transportation and material moving machine and vehicle operators .....	5,215	14.1	1.6	16.3	790	85
Motor vehicle operators .....	4,084	14.1	1.5	15.4	620	63
Bus drivers .....	638	12.2	1.8	17.9	84	11
Bus drivers, transit and intercity .....	203	12.2	1.8	17.9	27	4
Bus drivers, school .....	435	12.2	1.8	17.9	57	8
Taxi drivers and chauffeurs .....	132	16.7	1.6	16.4	24	2
Truck drivers .....	3,274	14.3	1.5	14.9	506	49
Driver/sales workers .....	305	6.8	2.0	19.9	21	6
Truck drivers light and heavy .....	2,970	15.1	1.4	14.4	486	43
All other motor vehicle operators <sup>2</sup> .....	40	15.1	1.7	17.4	6	1
Rail transportation workers .....	85	6.6	3.4	34.2	5	3
Locomotive engineers <sup>2</sup> .....	33	6.6	3.4	34.2	2	1
Railroad brake, signal, and switch operators .....	14	6.6	3.4	34.2	1	( <sup>1</sup> )
Railroad conductors and yardmasters <sup>2</sup> .....	25	6.6	3.4	34.2	2	1
Subway and streetcar operators <sup>2</sup> .....	3	6.6	3.4	34.2	( <sup>1</sup> )	( <sup>1</sup> )
All other rail transportation workers <sup>2</sup> .....	8	6.6	3.4	34.2	( <sup>1</sup> )	( <sup>1</sup> )
Water transportation and related workers .....	56	18.7	3.8	38.4	11	2
Able seamen, ordinary seamen, and marine oilers <sup>2</sup> .....	23	18.7	3.8	38.4	4	1
Captains and pilots, water vessels <sup>2</sup> .....	19	18.7	3.8	38.4	4	1
Mates, ship, boat, and barge <sup>2</sup> .....	8	18.7	3.8	38.4	2	( <sup>1</sup> )
Ship engineers <sup>2</sup> .....	6	18.7	3.8	38.4	1	( <sup>1</sup> )
Material moving equipment operators .....	808	14.6	1.7	16.5	123	13
Crane and tower operators .....	49	12.6	2.3	22.6	6	1
Excavation and loading machine operators <sup>2</sup> .....	106	4.0	1.9	18.8	5	2
Hoist and winch operators <sup>2</sup> .....	11	14.2	1.8	17.9	2	( <sup>1</sup> )
Industrial truck and tractor operators .....	415	17.7	1.2	11.8	77	5
All other material moving equipment operators <sup>2</sup> .....	228	14.3	2.3	22.6	34	5
All other transportation and material moving equipment operators <sup>2</sup> .....	183	15.2	1.9	19.4	31	4
Helpers, laborers, and material movers, hand .....	5,142	28.8	3.3	33.3	1,573	171
Cleaners of vehicles and equipment .....	288	33.9	3.2	31.6	110	9
Freight, stock, and material movers, hand <sup>2</sup> .....	822	36.9	3.7	36.7	305	30
Hand packers and packagers .....	984	20.9	2.5	24.7	228	24

See footnotes at end of table.

**Table 10. Total and net replacement rates and annual average replacement needs, 1998-2008 — Continued**

(Numbers in thousands)

1998 Matrix occupation	Total employ- ment, 1998	Replacement rate (Percent)			Annual average replacement needs, 1998-2008	
		Total, 1995-96	Net, 1998-2008		Total	Net
			Annual average	10-year		
Helpers, construction trades .....	576	27.3	4.6	46.0	163	26
Machine feeders and offbearers .....	213	19.0	3.0	30.2	40	6
Parking lot attendants <sup>2</sup> .....	86	15.1	1.7	17.4	15	2
Refuse and recyclable material collectors <sup>2</sup> .....	99	37.9	3.9	38.7	38	4
Service station attendants .....	141	28.8	4.4	43.8	40	6
All other helpers, laborers, and material movers, hand <sup>2</sup> .....	1,934	30.4	3.3	32.7	628	63

<sup>1</sup> Less than 500

<sup>2</sup> One or more Current Population Survey (CPS) based occupations may be used to estimate CPS based data. See Chapter 2.